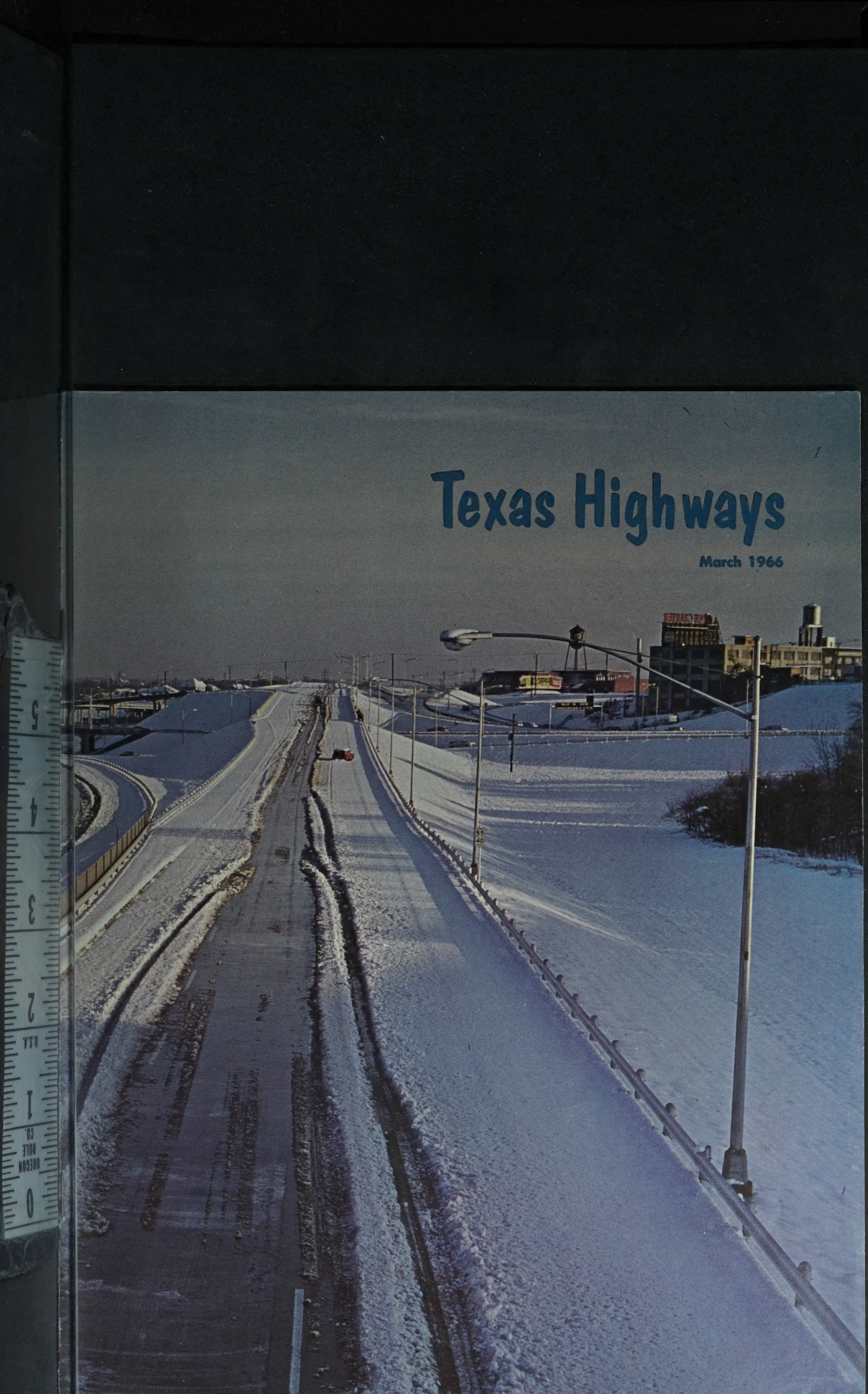
Texas Highways
March 1966

ARCHITECT

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About Our Cover

White snow and blue shadows transform I.H. 810 in Fort Worth after a winter's storm. As shown in the photographs beginning on page 3, such scenes were in evidence in most sections of Texas during January. Photograph by Jack Lewis.

Inside Front Cover

At vacation time this year, set your sights on Sea-Arama of Texas, Galveston's marine aquarium that opened last November. In a 54-acre lush, tropical setting, the oceanarium and 28 aquaria will house 300 species of fish and a team of performing porpoises. Photograph by Carl Schuh, Galveston.

Editorial .....

Better Communities — a Cooperative Effort.

Paul Sommer, engineering aide in District 16, was named outstanding citizen of the year in 1965 for his work with the youth of the Karnes City community, work on the city park board, help with the hospital association, leadership in church work, and for serving as a member of the volunteer fire department.

Members of the Texas Highway Commission are all active in civic affairs, serving chambers of commerce, on Boy Scout councils, Lions, Rotary, and Kiwanis clubs, hospital boards. And, of course, all were active in promoting good roads before being appointed to the Commission.

Resident Engineer Frank Gallaway of Livingston in District 11 is a leader in chamber of commerce activities and was named man of the year in Polk County two years ago. He also helped to build the city park in Livingston.

These are just a few examples of civic participation by Highway Department people. Unfortunately, this type employe seems to be in the minority . . . so much so one West Texas district engineer was moved to elocution. He said that the district office receives the utmost cooperation from city and county officials when it comes to highway work in the area. That's fine. But, complains the engineer, Department employes do not cooperate with local officials in such programs as United Fund, poll tax drives, Little League, PTA, polio shots, and various civic programs. He thinks cooperation should work both ways and would like to see Department employes take more of a hand in local civic affairs—not necessarily for the district or the Department, but for their own growth and enlightenment.

Of course, the Department's maintenance men can always be counted on in times of emergency —fires, floods, tornadoes—to do more than their share to help the community. But these are official acts above the call of duty, not the day-to-day services where a man gives of his free time and energy to work for the betterment of his town.

Another district engineer says most of his key personnel belong to civic clubs and participate to a limited extent in community-developing projects. He believes employes in the smaller towns in the district take part more in civic affairs than those in the larger cities.

Do key personnel in the Department rise to responsible jobs because they are active in community affairs or are they active in voluntary work because of their rank? It seems to be a two-way street. We do not suggest that all employes become active in civic programs to advance within the Department. But all employes should give serious thought to cooperating with those civic agencies actively engaged in bettering conditions within their community.

Indirectly, the citizens of Texas are paying our salaries. It is only natural, then, that while we enjoy the benefits of a community we should also give in return.

SNOW MAKES THE SCENE

BLINDING SNOWSTORMS raged across most of Texas on two weekends in January. From the Panhandle south to San Antonio, up to 10 inches of the white stuff blanketed most of the state, closing schools, paralyzing traffic, and plunging temperatures to near zero.

The northern half of the state got the brunt of it, and the stormy weather began even earlier in the Amarillo district where all highways were reported covered by ice on January 20.

Schools in most Panhandle cities and towns, and many in West Texas and the Red River Valley, were closed because of the raging snow. At many points the heavy snow fell on top of highways already glazed by freezing rain, making travel extremely hazardous.

The coldest winter storm in three years—on the weekend of January 21—left a record snowfall of more than seven inches in Wichita Falls and piled up 13 inches at Bowie. Between January 18 and January 27, a total of 12 to 18 inches fell in the Childress area.

Although no roads were closed, the Highway Department warned of hazardous driving because of the snow and icy roads from Amarillo, Lubbock and Childress as far south as Waco and Brownwood.

Highwaymen were out in full force over the long cold weekend, shoveling snow, sanding bridges, rescuing stranded motorists, and otherwise making heroes of themselves, as usual.

With the state still reeling from the first blow, storm warnings were hoisted again for snow and sleet on January 28 in Abilene, Amarillo, Childress, Wichita Falls, and Lubbock districts. Again, roads were treacherous but with all hands on deck, motorists found relatively smooth sailing, and no highways were closed. Maintenance crews did their work well. ■

For an idea of what it was like, take a look at the photographs on the following pages.

Motorists creep to work along U.S. 277 on the morning of January 21 as the second storm of the season invades Wichita Falls. This photograph was made at the intersection of U.S. 277 and Loop 11 three miles from downtown Wichita Falls. Photograph courtesy Times Publishing Company, Wichita Falls.

Maintenance Construction Foreman William B. Ray of Munday (District 25) inspects snow removal on U.S. 82 five miles east of Benjamin. One mile ahead in the wake of the January 29 accumulation of snow, a Highway Department maintainer with a drag blade clears a four to six-foot swath from the shoulder.

On the morning of January 22, Dallas was decked out in a blanket of white in the wake of the winter's first storm. Frontage roads along I.H. 20 (under construction, center) were cleared quickly. Photograph by Marvin Bradshaw.

A white Christmas came one month late to Amarillo. District Maintenance Engineer J. M. Harris had his camera ready on January 27 when the snow turned District 4 headquarters into a wintry wonderland. Harris drove to the west side of Amarillo for a view of the U.S. 66-U.S. 66 Business intersection, and then to Palo Duro State Park for another change of scene. From Park Road 5, a Parks and Wildlife Department litter barrel spreads the good word on litter.

After snow is removed, District 8 crews sand I.H. 20.

Slow and steady is the pace along I.H. 20 near Abilene.

Paris Postmaster Commends Highwaymen

In a letter to the Paris News, *Postmaster Mark L. Hodges expressed his admiration of the Highway Department maintenance crews that worked long hours during the stormy weekends to make the highways safe for motorists:*

Hurrah for the Texas Highway Department.

I have just returned from a trip to Lubbock and I was so impressed by the action of the Texas Highway Department along the way I felt that a note to your paper might let all of us "stick out our chests" in justifiable pride concerning this efficient department of state government.

As you know, we are in the midst of a cold snap and the further we drove towards Lubbock, the "snappier" it was. From Wichita Falls west, the highway department snow plows were in operation, clearing the snow from the highway. In the first place, without them traffic would have come to a halt.

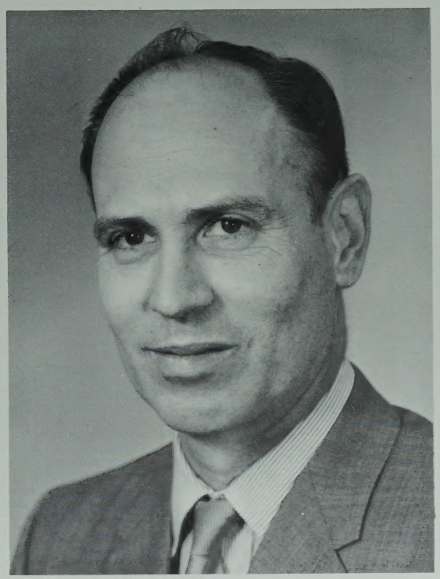
Not only were they doing a highly efficient job of clearing the highway of ice and snow, but because of the hazardous slick sections and constantly drifting snow, inevitably some motorist would lose control and end up in the ditch or on the side of the road vainly trying to get moving again. The highway department crews with the proper equipment would proceed to extricate the hapless victim, and with a courteous word of caution to drive carefully, send him on his way.

It is true these men were dressed for the cold weather and had the equipment and receive pay for their work, but it was their contagious smiles, and cheery greetings which exhibited an esprit de corps which was a job to behold.

I commented on this to my son who was with me and he agreed. He reminded me that he was a part-time employe of this organization, and said that was one reason he liked his job so well, because employes all seemed so proud of their job and happy doing their work and anxious to do a good job.

Congratulations then to the Texas Highway Department, an efficient, well-organized and useful government agency of which we can all be justly proud. ■

Brooks Evans Heads District 9



ELTON BROOKS EVANS
District Engineer
Waco, District 9

ELTON BROOKS EVANS is the new district engineer of District 9, Waco. State Highway Engineer D. C. Greer appointed him to replace the late James H. Aiken on February 1.

Evans became assistant district engineer for the Waco area in 1964, and he had served as acting district engineer during Aiken's extended illness. Aiken died on January 5.

A native of Nevada, Texas, the 46-year-old Evans is a veteran of 16 years' service with the Highway Department in District 9.

After completing public schools in Nevada, Evans began his college career at Baylor University. Later, he transferred to The University of Texas where he received his degree in civil engineering in 1948.

During World War II, Evans served three years in the U. S. Army Corps of Engineers, mostly in Europe.

Evans joined the Highway Department as a junior draftsman in Clifton in 1950. Before transferring to Groesbeck as resident engineer two years later, he had risen to the position of associate resident engineer in Clifton.

On January 1, 1963, Evans became senior resident engineer in Belton, and the following year he moved on to Waco as district administrative engineer. His appointment to the post of assistant district engineer came on September 1, 1964.

Evans met his wife, the former Mary Vurns of Uvalde, while a student at Baylor. They have three children: Sandra, recently married; Judy, a senior in high school, and Brooks Jr., 13.

District 9 includes Hamilton, Bosque, Hill, Coryell, McLennan, Limestone, Bell and Falls Counties. ■

I.H. 410 Es Numero

THE FIRST Interstate loop to be completed around a major city in Texas was officially dedicated on January 19 when the ribbon was cut to open I.H. 410 in San Antonio.

The 55-mile long Loop 410 encircles San Antonio at distances varying from six to 10 miles from the downtown area. It was completed at a cost of $32 million for construction and $7 million for right of way.

The final section of the loop was less than one mile long, extending from 0.2 mile south of W. W. White Road to 0.4 mile north of the road. It was placed under contract last April and was completed at an estimated cost of $357,181.

Herbert C. Petry Jr., chairman of the Texas Highway Commission, cut the ribbon at dedication ceremonies at 4 p.m. January 19 at the W. W. White Road overpass. Mayor Walter McAllister and County Judge Charles W. Grace held the ceremonial ribbon as Petry snipped it.

The first traffic across the overpass was a cavalcade of animal-drawn vehicles, vintage automobiles, and the East Central High School band.

Herbert C. Petry Jr., chairman of the Texas Highway Commission, praises the vision of the citizens of San Antonio and Bexar County as he snips the ribbon and officially dedicates the first Interstate loop completed around a major city in Texas.

The San Antonio Chamber of Commerce sponsored a reception and banquet to honor Texas Highway officials at the Menger Hotel shortly after the dedication ceremonies. At the dinner Petry lauded the citizens of Bexar County and San Antonio "for having the courage to make a vision of 10 years ago become a reality."

"Much of the praise given us tonight is not really ours," Petry told the crowd of 175, "but it is yours. It belongs to your county officials and Mayor Walter McAllister for providing the leadership needed in such a vision."

Petry also announced "the largest bid to be submitted in the history of the state will be let to contract next week, for a highway project which will connect I.H. 10 and HemisFair 1968."

Also recognized at the dinner were State Highway Engineer D. C. Greer, Assistant State Highway Engineer J. C. Dingwall, J. H. Kultgen, Highway Commission member; District Engineer R. L. Lytton, and H. B. Zachry, chairman of the board of directors of HemisFair.

On Tuesday morning, the day before the dedication, a team of horseback riders and a wagon from the Alamo Trail Riders set out on the 55-mile long journey around the loop in driving rain and near freezing temperature. A 1913 automobile joined the cavalcade, but fortunately for the driver, he did not need to brave the elements until noon on

Looping San Antonio. District 15 headquarters is located at the intersection of the recently completed I.H. 410 loop and U.S. 87 (business route).

Wednesday in order to complete his circuit of the loop in time for the dedication festivities.

The city of San Antonio gave appropriate fanfare to their "highway first." The *San Antonio Light* published a special 12-page supplement the day before the dedication, and the *San Antonio Express and News* published a Sunday supplement booming "Twenty years of progress on Bexar County highways."

Radio stations carried a report by Melvin Sisk, vice president of the chamber of commerce. Sisk quoted Petry as saying, "To the San Antonio Chamber of Commerce goes the lion's share of the credit for 20 years of highway development which has literally changed the face of Bexar County."

An editorial in the *San Antonio News* on the day of the dedication had this to say:

"The completed nonstop highway, a divided expressway of top quality, is a facility made possible only by the diligent, cooperative efforts of state and local authorities . . .

"An Interstate highway connection, Loop 410 will augment the growing expressway network connecting this South Texas region with other parts of Texas and the nation. Just as the completed loop is a triumph for highway designers, it is also an asset for community business interests. It will become a valuable link to Texas' vast, modern network of highways."

Loop 410 was 10 years in the making, from the first segment, a 2.8-mile

section between Çulebra and Bandera Roads that was completed in September 1957, to the final portion around W. W. White Road where the ribbon was cut to dedicate the entire route.

Chamber of Commerce President Red McComb, writing in *The San Antonian,* the chamber's newspaper, said, "For the past decade successive chairmen of the chamber's Highway and Public Works Committee have provided the leadership—the *sine qua non*—to bring about the step-by-step completion of the loop. The mantle of responsibility passed with unflagging continuity from the late Datus Proper, to Leslie Neal, to Jim Francis . . . Both this and future generations owe them a deep debt of gratitude . . . We take our hats off and observe January 19 as a special day to honor Herbert C. Petry Jr., J. H. Kultgen, Hal Woodward, D. C. Greer, and J. C. Dingwall." ■

This is a part of the 55-mile loop around San Antonio. I.H. 410 overpasses Southton Road (foreground) just south of Brooks Air Force Base. Southton Road intersects U.S. 181 in the background.

Muleskinner A. J. Barkhausen drove his mule team for two days in rain and near freezing weather over the 55-mile I.H. 410 loop around San Antonio and arrived in time for the 4 p.m. dedication ceremonies on January 19. "I'm glad that's over," Barkhausen remarked at the end of his journey. Several Alamo Trail Riders made part of the trip with him.

Engineer of the Year

WALTER LOONEY, designing engineer, Secondary Roads Division in Austin, has been named Engineer of the Year by the Travis Chapter of the Texas Society of Professional Engineers.

Looney was honored February 26 at a dance "in recognition and in appreciation of distinguished professional services to society and to the engineering profession." Chapter President Farland Bundy of the Bridge Division said, "Dink has given unselfishly of himself toward helping young engineers and the engineering profession."

Presently state director, Looney has held every office in the Travis Chapter, including that of president in 1962.

The Travis Chapter membership is 600 engineers. Approximately 6,000 engineers belong to the 27 chapters of TSPE in Texas. Professional engineers celebrate Engineers' Week each year during the week of George Washington's birthday.

Looney has been called "an engineer's engineer." He never misses an opportunity to speak at a meeting where he can give a membership-building pep talk.

A graduate of The University of Texas in 1949 with a B.S. in civil engineering, he began working with the Department on a part-time basis in 1948 and full time the following year. Dink and his wife Nancy have two children, Keith and Jan. ■

Walter (Dink) Looney
Secondary Roads Designing Engineer

Fort Worth — Dallas Area Booming

POPULATION of the 10-county Dallas-Fort Worth region will increase by more than one and a half million residents in the next two decades, preliminary studies for the region's urban transportation plan show.

A technical report on the economic base analysis of the 10 counties surrounding the two cities projected the region's 1985 population at 3,642,308, compared to 2,049,110 in 1964.

The core counties of the region—Dallas and Tarrant —will continue to include the overwhelming majority of residents, according to the report. The two counties will include 89.8 per cent of the 10-county population in 1985, compared with 86.8 per cent in 1964.

Dallas County is projected for an increase from 1,158,400 in 1964 to 2,302,570 in 1985. Tarrant County is expected to grow from 620,600 in 1964 to 967,518 in 1985.

The report was prepared by the Bureau of Business Research of The University of Texas. It was sponsored by local governments in the area and the Texas Highway Department. The U. S. Bureau of Public Roads is cooperating in preparing the over-all plan. The report will aid in preparation of the urban transportation plan required by the Federal Aid Highway Act of 1962 as a requisite for assuring federal financial participation in metropolitan area highway programs.

Among the more dramatic forecasts is the trebling of electronic industry employment. The 1964 level of 27,000 employes in the electronic industry in Dallas County will rise to 70,000 in 1985, the report said.

The designation of a regional airport site between the two cities will give added impetus to the midcities area. The report cites the 5,000-acre Great Southwest Industrial District, now housing industries employing 10,000 workers. By 1985, employment in the center, located mainly in Tarrant County, will be between 125,000 to 150,000.

The report also indicates that the midcity area might rise as a "third center of residential, commercial and industrial growth."

Strong centers of industrial growth in Dallas County are Richardson and Garland, heart of the electronics industry. Completion of the Science Research Center in Richardson "will advance the region to a place of national prominence in the physical sciences."

Median income in the counties was projected at $7,200 per family in 1970 and $9,700 in 1985. The 1959 median income was $5,200. ■

Problems of EVICTION

Franklin C. Young, District Administrative Engineer
San Antonio, District 15

SINCE THE INCEPTION of the Interstate program, the State of Texas has obtained possession of more than 25,000 parcels of land needed for Interstate right of way and has had to resort to the process of eviction for only three of them. Therefore, for us, the eviction of a property owner is indeed a rare action.

Our primary problem is not eviction but how to avoid it. At the first indication of a possible eviction on Interstate right of way, notification should be made by the district to the Right of Way Division in Austin. Such notice is promptly forwarded by that division to the office of the State Highway Engineer, since administrative approval is required before the State can initiate an eviction process.

As all persons involved in right of way acquisition are well aware, every possible legal means should be used in an effort to obtain possession. Eviction should be used only as a last resort.

In negotiation, the time of occupancy and possession is agreed upon prior to closing the transaction. Therefore, the problem of obtaining possession is more acute where eminent domain action is required.

At the time we deposit the award specified by the Special Commissioners, a letter is written to the property owner's attorney with a copy sent to the property owner advising that the award of the Special Commissioners has been deposited in court and may be withdrawn, and that the State is entitled to immediate possession. However, in order to prevent a hardship upon the occupant, a period of time, usually 30 days, will be allowed to prevent any undue inconvenience to the occupants.

This notification has been very effective. It is generally acknowledged by the attorney with a date given for the State to take possession or the reason stated why possession cannot be given on that date and a longer period of time requested. This opens the door for further friendly negotiations as to possession. Where no response is obtained from such notice, personal contact is first made with the attorney and, second, attempted with the former property owner. If successful, the agreement is usually reduced to writing and friendly reminders are sent to the occupant to remind him of the agreed possession date.

On several parcels in our district, the required administrative approval for eviction has been received and later efforts to obtain possession have been successful. In some cases, with administrative approval received, a construction contract was awarded and discussions with the contractor determined that the sequence of the work would permit delayed eviction. In three or four cases, the presence of construction equipment in the vicinity of the occupied residence discouraged the occupant to such an extent that he willingly gave the State possession. Therefore, wait as long as possible for the actual eviction and try everything legal and within departmental policy to obtain possession, and proceed to evict only when further delay would interfere with construction.

If, despite the best efforts of the Department, eviction ultimately becomes necessary, three principal procedures are available: Writ of Possession, Injunction, and Force-

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This paper was presented by Mr. Young at the 39th Annual Texas Highway Short Course held at Texas A&M University in December 1965.

"State vs. Landowner" by Clinton H. Oehler

able Entry and Detainer, the first two being appropriate in eminent domain acquisitions, the latter in negotiated purchases.

Application for the Writ of Possession is made to the court in which the eminent domain proceeding was filed, and the condemnor alleges: (1) that the award and costs have been deposited, (2) that the condemnee is in possession, and (3) that he has wrongfully refused to deliver same to the condemnor. Ordinarily, the court will immediately enter an order directing the clerk to issue a writ to the sheriff. That writ commands the sheriff to deliver possession of the premises to the condemnor with the warning of "HEREIN FAIL NOT." The sheriff then proceeds to eject physically the condemnee and his personal property from the land in question.

Judge Madison Rayburn, Harris County Court at Law Number 1, suggests the Writ of Assistance or Injunction could sometimes be utilized in such cases. Application is again made to the same court which would be authorized to grant the condemnor's motion as a means of maintaining or protecting the court's jurisdiction in the case. The condemnee would be commanded to appear before the court to show cause why he should not be prohibited from interfering or denying the condemnor's taking possession. This differs from the Writ of Possession in that the order is direct from the court to the condemnee personally and is enforced through contempt proceedings.

Of a statutory nature, as opposed to the common law foundation of the Writs of Possession and Assistance, is our present day Forceable Entry

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"State vs. Landowner," is the first place winner in the 1965 Texas Public Employees Association photography contest. Clinton Oehler, District 15 right of way section, said problems of land acquisition were his concern when he composed his prize winning entry: "I feel that this photo, with its law books, pen, ink and paper, signifies the legal proceedings which have to be followed in order to obtain land."

and Detainer action. This would apply in most negotiated purchases where the condemnor has granted an express consent to the owner to remain in possession for a specified period after the purchase transaction.

Application or petition is filed in the Justice Court of the precinct where the property is located. Strict adherence to the provisions of Articles 3973, 3974, and 3975 of the Civil Statutes, as well as the appropriate rules of civil procedure, is mandatory. It must be alleged and shown that there has been a written demand for possession, and that there is a specific basis for the claim to possession. All this must be sworn to. Either party may request trial by jury, and the statute further requires posting of possession bond. The judgment of the court is then enforced through issuance of a Writ of Restitution, i.e., possession is restored to the rightful party by the sheriff. Unless the person being evicted is a common trespasser, it must also be established that a landlord-tenant relationship existed.

In both the Writ of Possession and the Forceable Entry and Detainer procedures, it must be remembered that the intent is that the sheriff literally put the evicted person and his personal belongings out on the street. By depositing the award, the State does not automatically gain possession or the right to enter the property on its own strength, and title may or may not have passed, depending on whether Final Judgment has been entered.

The foregoing procedures evolved in our system of law historically to avoid legal self help, which would inevitably lead to violence. Society did not and does not want justice or the law upheld through force of private or individual persons. Only anarchy would result. The State has in these instances a *right* to possession, and if denied that right by the condemnee or property owner, remedies are available to enforce that right through proper judicial channels.

In our district, we have had only one actual eviction—the third by the State of Texas for highway right of way. It involved an elderly widow who had given prior notice to the State that actual eviction was the only way the State would ever obtain possession of her property. A careful review of all steps required prior to the actual issuance of the writ was made and the statutes require the sheriff to remove the person and belongings off the premises. The Writ of Possession commanded the sheriff to seize the property (real) and deliver possession to the State of Texas; and further commanded the sheriff to remove all persons and their personal property from the premises.

The sheriff, by letter, informed the court that his office did not have the personnel or facilities to enforce the writ because the household goods and personal effects must be stored to prevent waste and deterioration. The property was located in the center of a large clearance project for the new highway, so goods could not be placed on the public right of way in front of the property. Also, certain precautions had to be made to protect and conserve the health of the person or persons to be evicted. Request was made for bonded transfer and storage facilities, and any health precautions deemed necessary by the sheriff. The court then issued an order to the sheriff to obtain transfer and storage facilities and to take health protective measures. The costs were taxed as court costs. Therefore, the State was able to pay these costs along with the regular court costs.

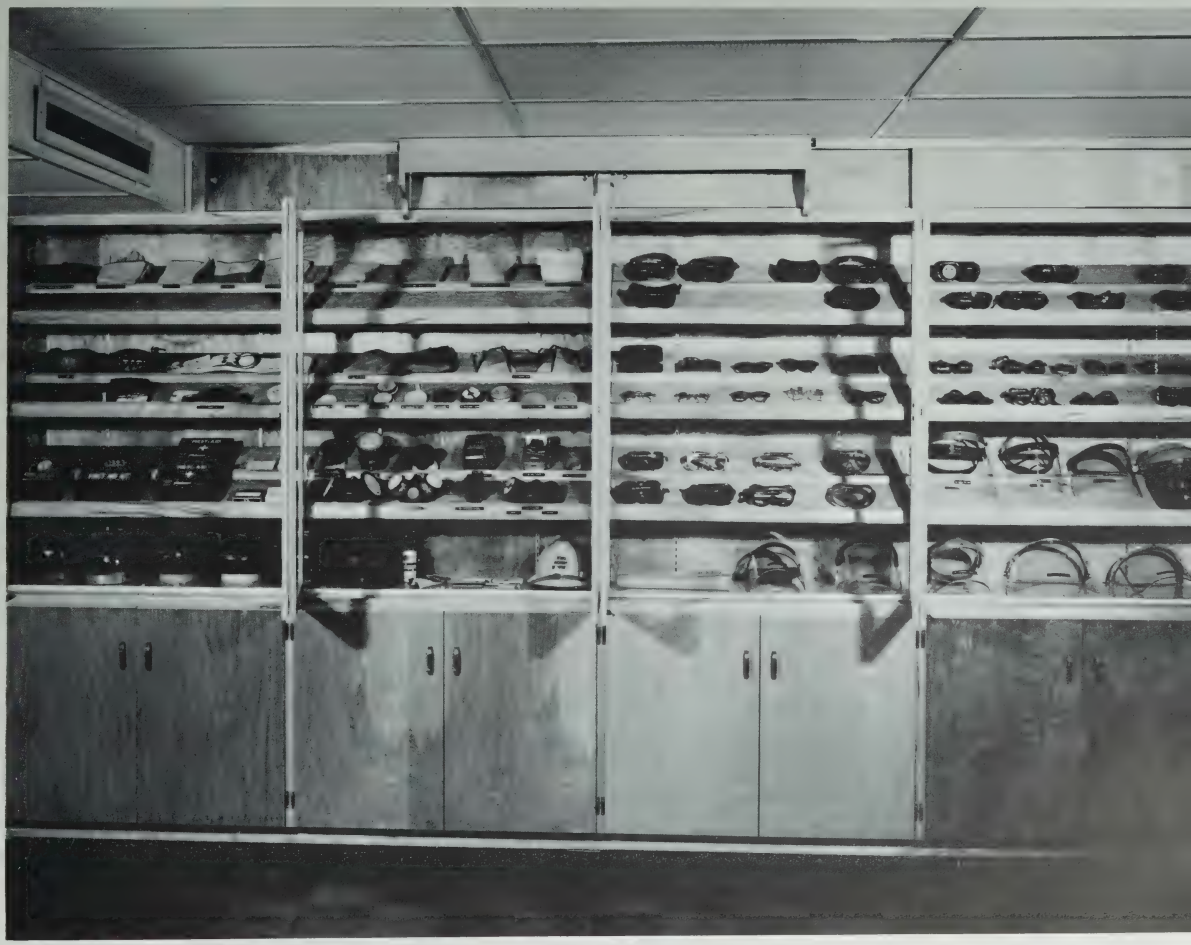
When a person is evicted, every precaution must be taken to see that the one evicted does not repossess the premises. If this is done, we are in the same position if not worse than before the eviction, because we have the writ or order carried out by the sheriff and a trespasser on our hands. A new and separate court action is necessary to remove the trespasser, because the Writ of Possession has been fulfilled. Do not serve the writ without eviction. ■

When eviction becomes necessary:

- Notify File Right of Way Division immediately when eviction appears necessary.
- Secure administrative approval prior to any actual act toward eviction.
- Try every means at your disposal to obtain peaceful possession.
- Complete all necessary legal steps.
- Wait as long as possible for actual physical eviction.
- Have the writ served and the person evicted promptly.
- Prevent reoccupancy by the evictee.
- Dispose of the improvements as quickly as possible.

Safety on Display

THE INSURANCE DIVISION recently constructed this safety display cabinet in the Insurance Building at Camp Hubbard. The cabinet is full of protective wear and safety devices produced by major manufacturers. "The display is invaluable," said C. G. Curtis Jr., director of the division, "in training personnel to use the items and for evaluating items supplied by manufacturers." Curtis added that district personnel are invited to drop in at the Insurance Building to see the display and to discuss the protective wear. And a safety display case, too: All safety instructors (Insurance Division field men) are now equipped with this protective wear demonstration case to show district personnel the value of each item. ■



Advance Right of Way Acquisition

W. O. Threadgill, Supervising Right of Way Engineer
Right of Way Division, Austin

THOSE OF US ENGAGED in the acquisition of right of way are well aware that the highway program nationwide has expanded so rapidly that it has been necessary for every state to conduct an accelerated right of way program.

Some states have been more successful than others in acquiring right of way in time to prevent delays in construction contract advertising. Procedures used by the states have evolved without the benefit of a guide outlining methods that may be used to achieve adequate lead time. (The Bureau of Public Roads has defined lead time as the interval "between the time design has progressed to the point where right of way acquisition can start and the date of advertisement of the related construction contract.") Accordingly, there is no accepted practice for this activity and no national standards by which one state may compare its procedures with those of other states.

The Right of Way Committee of the American Association of State Highway Officials discussed this problem at Atlanta in the fall of 1964. The Committee asked A. H. Christian, right of way engineer, Texas Highway Department, to chair a subcommittee to study the problem of advance right of way acquisition. The subcommittee also included the director, Right of Way Division, Florida State Road Department; the engineer of right of way, Illinois Division of Highways; and the chief right of way agent, Arizona Highway Department. Art Grace was named secretary, recorder, and legman in putting the study together.

The scope of the study was limited to "an investigation of the methods used by the various states to program, finance, and acquire right of way in advance of construction advertising." To acquire the raw data, a questionnaire was developed and mailed to the AASHO Right of Way Committee member of each state, the District of Columbia, and Puerto Rico. The questionnaire contained 26 questions of a broad nature to cover procedures used by all states operating under various laws and administrative policies. Forty-five of the 50 states, the District of Columbia, and Puerto Rico, returned answers to the questionnaire. Answers from Texas were derived by averaging the information submitted by four of the most heavily committed districts.

In the initial considerations, the only AASHO guidance that could be found was a statement of the principle that "the state highway department should have its construction program planned in such a manner as to provide the maximum practicable lead time to allow efficient and economical right of way acquisition." It was assumed that states would have sufficient authority and finances to subscribe to this principle, as Texas does. As the study progressed, we found this assumption to be incorrect.

Personnel

While there is apparently no major shortage of personnel in our right of way activities in Texas, 23 states indicated that the lack of trained individuals to carry out the expanded programs handicapped right of way acquisition. A training program for right of way personnel was endorsed by the AASHO executive committee and published in December 1962. Yet, only about half the states conduct scheduled highway department courses for right of way personnel. The greatest reliance is on on-the-job training, which may indicate a lack of administrative support for specialized training. The most alarming aspect was that in some states, even though right of way acquisition could be programmed in advance, the staff

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This paper was presented by Mr. Threadgill at the 39th Annual Texas Highway Short Course held at Texas A&M University in December 1965.

would not be able to appraise, negotiate, and acquire right of way any faster because of personnel shortages. The most critical shortage nationwide appeared to be of appraisers. Some states reported a shortage of negotiators and attorneys.

Legal or Legislative

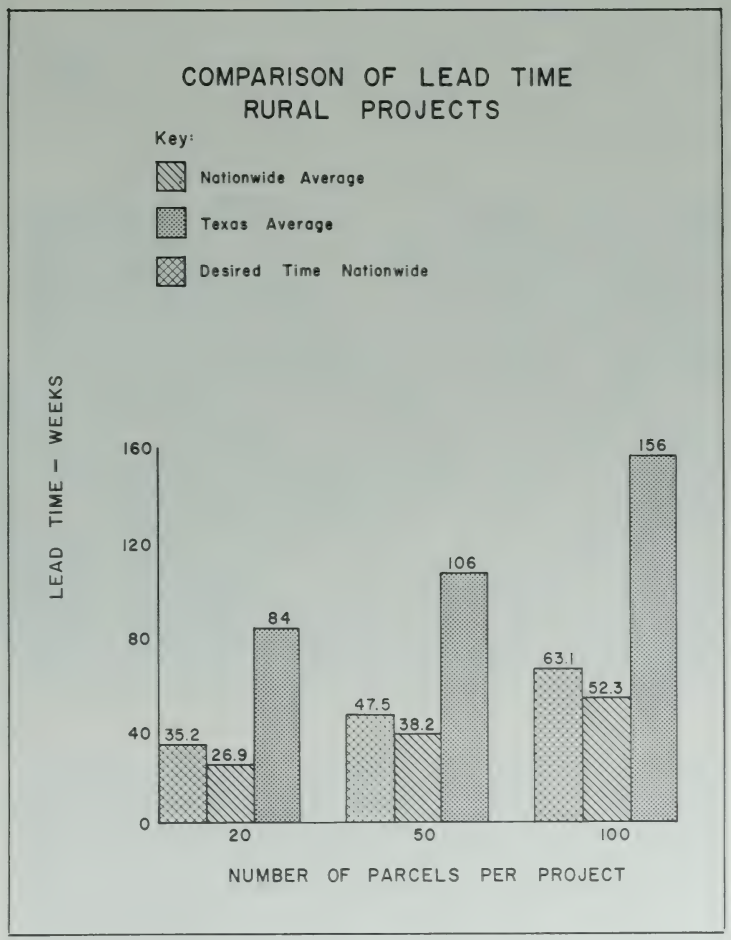
In respect to the legal or legislative factor, 39 states, including Texas, have legislation enabling them to secure possession of right of way within a reasonable time. The study showed that legislative restrictions imposed by some states slow advance acquisition of right of way. One of these is the requirement that only the land actually needed for right of way may be acquired. Some overcautious states have interpreted this to mean they cannot acquire right of way before completion of construction plans.

Another restriction is a law whereby commissioners can defer awards for a considerable period after filing a condemnation petition or where possession is delayed for a period of time following a commissioners' award.

Two states have mandatory condemnation. Other states reported condemnation ranging from 4 to 95 per cent where there is federal participation. Where there is no federal participation, condemnation ranges from 0 to 44 per cent. On Interstate projects in Texas through October 1965, 18.1 per cent of the parcels have gone to condemnation. This compares to a nationwide average of 27 per cent.

Finance

We in Texas have been able to develop adequate lead time by holding the right of way project in state finance and deferring requests for federal reimbursement until receiving a project agreement with the Bureau of Public Roads. Twenty-four other states operate in a similar manner. Of the remaining states, 11 indicated the inability to finance right of way acquisition was a deterrent to lead time. Apparently these states are reluctant to budget funds for advance right of way. Legislation to provide federal financing for advance acquisition was considered desirable by 25 of the 45 states reporting, including Texas. However, several of the states that favored the legislation, as well as those opposed to it, stated that the use of such financing would be limited because of inadequate design capacity.



Administrative Policy

Lead time to a great extent is dependent upon administrative policy. Right of way acquisition should be recognized as a distinct phase in project development. Responses to the questionnaire indicated that most states program right of way as a phase in moving a project from preliminary engineering to construction. The principal difficulty seems to be that engineering schedules are not adequately controlled. In Texas, authorization for preliminary engineering averages five years in ad-

vance of construction. The nationwide average is a little more than three years, with one state showing only one year. Also, our authorization for acquisition averages three years prior to construction, while the national average is 21 months. One state shows only one month.

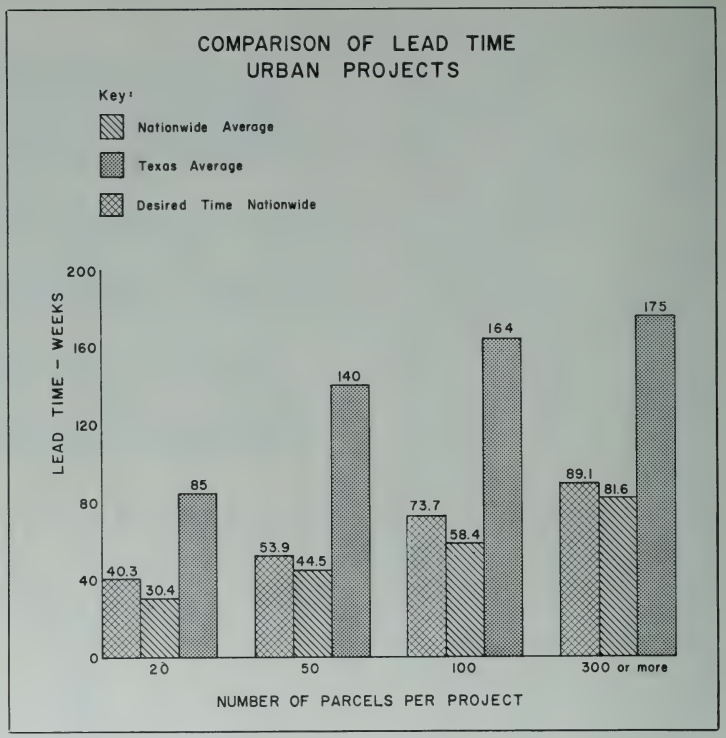
In addition to programming, there is a need for better coordination between the engineering and right of way functions. Last-minute design changes that require additional right of way are a major cause of inadequate lead time. Five states limit design changes that affect right of way acquisition immediately prior to advertisement for contract. Texas, like most states, has no such regulation.

Scheduling

Several functions must be considered when scheduling right of way acquisition—obtaining title information, preparation of the right of way map, property description and deeds, appraisal, appraisal review, negotiations or condemnation, payment and relocation of owners and tenants, disposal of improvements, and utility adjustments. The time needed to perform these functions varies, depending upon state law, administrative procedures, personnel available, and the nature of the project. Questionnaire findings reveal that lead time ranges from a minimum of eight weeks to a maximum of 216 weeks for projects of various sizes. (Figures 1 and 2 indicate Texas' favorable position in providing lead time.)

Other Factors

Of the factors that affect lead time, the most significant is utility adjustment. About half the states consider this to be a right of way function. Regardless of who is responsible for utility adjustments, provisions must be made for early agreement with the utility company to relocate its facilities so as not to delay construction. This can be done only through a concerted liaison effort between the highway department and the utility industry.



In summary, the study indicated that the most frequently mentioned factors which caused insufficient lead time are:

- Design delays or changes
- Failure to meet engineering schedule
- Inadequate financing
- Changes in priority of projects
- Administrative scheduling which does not allow sufficient time for right of way acquisition
- Political decisions
- Lack of trained personnel

Accordingly, the study contained a number of recommended actions pertaining to legislation (both state and federal), administration, engineering, and the right of way function that are necessary if the problems are to be resolved. Of major interest to us were the following:

- There should be established a federal revolving fund for advance right of way acquisition and utility adjustments from sources other than present highway revenues.
- There must be a definite correlation of right of way acquisition and utility adjustment work. Priority should be given to the acquisition and clearance of right of way parcels needed to make utility adjustments that must precede highway construction.

From the standpoint of lead time, we are fortunate to be associated with the Texas Highway Department. ■

Object Lesson:

HOW NOT TO INFLATE A TIRE

WHAT HAPPENS when a tire blows up?

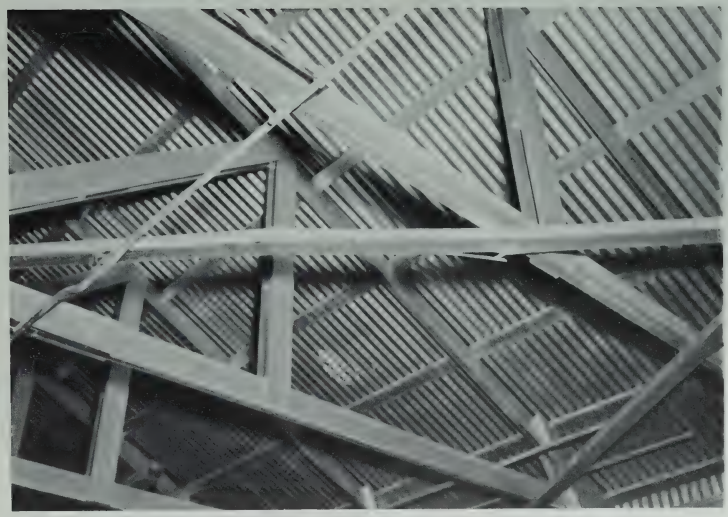
A maintenance man in Lubbock found out last month. He was inflating a truck tire when it blew up, literally, in his face.

Fortunately, the lock rim was turned down, so he wasn't killed. He felt lucky that he had to spend only a few days in the hospital with a bruised nose.

The photographs tell the story:

When the tire exploded, the turned-down lock rim bit into the concrete floor, accounting for the white circle shown in the photograph. The rest of the rim and the tire went straight up, struck the maintenance worker in the face, and continued on up to break a two by four brace at the ceiling.

Of course all the damage, to man and warehouse, could have been prevented by using the "safety cage" that was sitting in the back of the warehouse. ■



This month's feature on the Trans-Canada Highway, the longest paved highway in the world, was prepared for TEXAS HIGHWAYS readers by the Information Services, Department of Public Works, Ottawa; William H. Dumsday, Director of Information Services.

For those who may be thinking in terms of a trip north next summer, additional information and brochures are available from the Department of Public Works in Ottawa.

Trans-Canada Highway

It spans the entire breadth of one of the world's largest countries.

It cost over one billion dollars to construct.

It cuts through the heart of a mighty range of mountains.

It is by far the longest national highway in the world.

From St. John's on the eastern tip of the Atlantic island of Newfoundland to Victoria on Vancouver Island, lapped by the waves of the Pacific, a wide ribbon of concrete snakes its way 5,000 miles across Canada's 10 provinces closely paralleling the U. S. border, over almost every imaginable type of terrain. It passes through hundreds of miles of virgin forests, over rushing, untamed rivers, across the rich farm lands of central Canada and the waving wheat fields of the western prairies through the towering Rocky Mountains and on to its western terminus on the shores of the Pacific.

Prior to construction of this great highway it was not possible for normal automotive traffic to travel from coast to coast within Canadian limits. Motorists wishing to make such a journey were forced to go through the northern states for a considerable portion of the way.

The Trans-Canada Highway has a minimum right of way of 100 feet and a minimum pavement width of 22 feet. Over the entire route, grades and curves are reduced as much as possible. Wherever possible, curvature has been maintained at 3 degrees.

The Trans-Canada Highway has become a mecca for touring motorists from all over the world, and prosperity has followed its path. Towns and villages along its route—it bypasses most large cities—are thriving from the increased business, and remote sections of the country are developing.

Of the many outstanding engineering feats accomplished during the construction of this highway, the building of the road through one small section of the Rocky Mountains was, without doubt, the most dramatic.

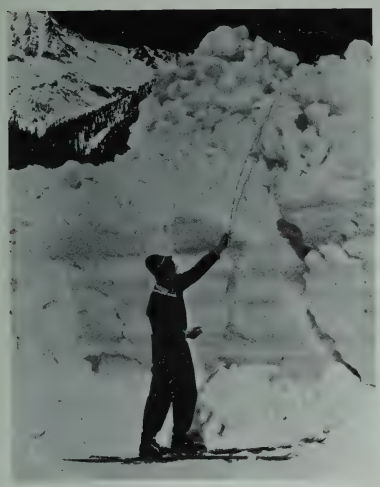
Trans-Canada specifications called for the most direct route possible and for an all-season, all-weather highway. To meet these specifications the engineers of the Department of Public Works made a daring decision. They would build the highway through rugged Rogers Pass in Glacier National Park, the most direct route to the Pacific but one fraught with difficulties.

Today the road through the Rockies is not only a reality but a dramatically exciting highway of breathtaking vistas. And thanks to careful planning and years of scientific study, the highway through the mountains is as safe as it is scenic.

Though only 27 miles long, the route through Rogers Pass presented engineers with many major problems. Perhaps the most perplexing of these was that this was avalanche country so it was decided to protect the highway by a unique system of "defense in depth."

Various types of protection were built on known avalanche routes to break up or divert snow slides long before they

The 5,000-mile long Trans-Canada Highway hugs the Atlantic Coast in Nova Scotia, one of Canada's easternmost provinces.



An engineer measures the height of a snow bank in the Rocky Mountains.

The Trans-Canada Highway sweeps past Mount Eisenhower, named for former President Eisenhower, in the Canadian Rockies.

reached the Trans-Canada right of way.

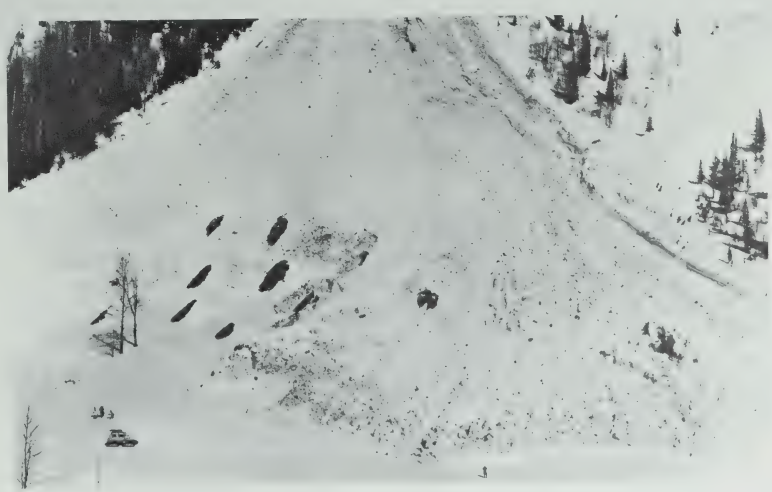
Perhaps the most successful of these defenses are earth mounds built on the principle of the concrete "dragon's teeth" used against armored fighting vehicles during the Second World War. The mounds act as a breaking obstacle in the path of an avalanche and also tend to perpetuate themselves by building up piles of snow which act as further defenses.

Another protective measure is the bench defense. These are dug into the side of a mountain to catch the snow slide and hold it. Some are 1,000 feet long and 150 feet wide with a 10-foot high lip at the outer edge. They require more maintenance than mounds because they must be cleared periodically of accumulated snow.

Diverting dams have two functions. The first is to change the direction of an avalanche so that it does not reach the highway. The second is to restrict the width of the slide thus reducing the length of a snowshed. These dams are made of earth and are from 20 to 25 feet high.

Two other methods of avalanche defense were also included in the over-all protective system. Permanent emplacements have been constructed from where gunners of the Canadian Army can lob mortar shells into known trigger zones to start a controlled avalanche before the snow build-up becomes dangerous. The preplanting of explosives to be set off by remote control is also used, but has a limited application because grizzly bears devour the charges with enjoyment and apparently no ill effects.

The road through Rogers Pass is, of course, only a tiny fragment of the Trans-Canada Highway. Engineering accomplishments on many other sections of the 5,000-mile route were nearly as great. The entire project has been one of surmounting difficulty after difficulty, and today to see this highway virtually completed is a source of great satisfaction to all concerned with its construction.



This photograph, taken from the highway in Rogers Pass, shows how an avalanche has been broken up and halted by earth mound defenses.

Problems of Continuously Reinforced Concrete Pavement

Frank McCullough, Supervising Designing Research Engineer
Highway Design Division, Austin

AS A RESULT of a comprehensive research project by the Research Section of Highway Design Division on the performance of continuously reinforced concrete pavement, there have been several recent revisions in design specifications. Also, some problems have developed with the use of this pavement.

There are two basic design details for continuous pavement, the concrete pavement continuously reinforced bar, and the deformed wire detail.

The Research Section recently recommended changes in the reinforcing bar details. One revision was the elimination of the hard-grade steel alternate from the detail. In the past the Department gave the contractor the option of bidding on 0.6 per cent hard grade steel with a 50,000 psi yield, or bidding on 0.5 per cent high yield steel with a 60,000 psi yield strength. This alternate was on most plans for about three years, but we received bids on it only one or two times.

We have also made a few changes in the longitudinal construction joint. With the old tongue and groove longitudinal construction joint, where there were more than two lanes, the female portion was formed with a tie bar in it and then the male section was placed. Those who have used this joint know the problems associated with it. First, in wrecking the forms, we would often get a shear failure of the upper lip. Or, during the interval between placement of adjacent lanes, a load of any type on the edge would produce a shear failure of the upper lip. In either event, there was an unsightly place that could not be corrected in the final placement.

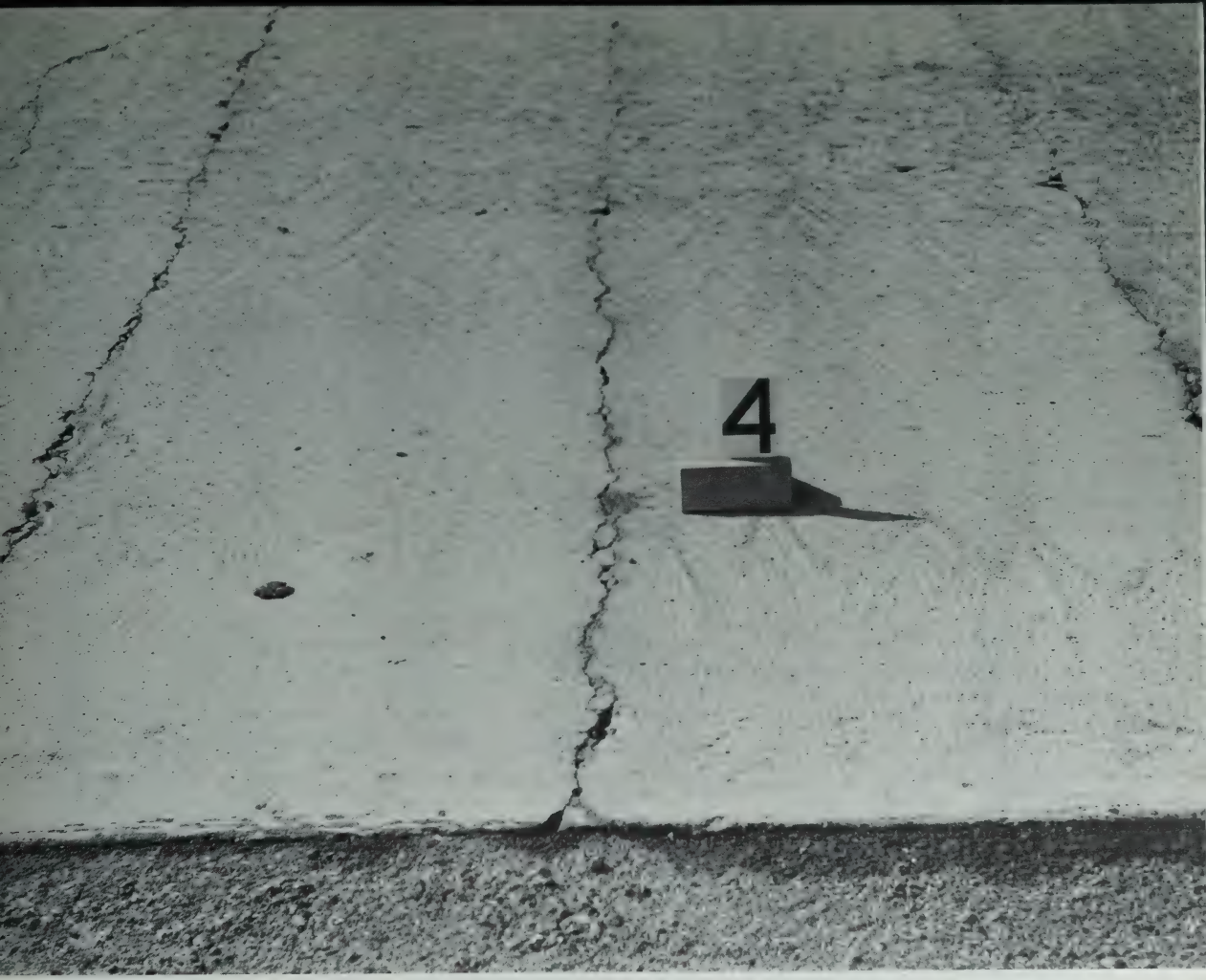
Examination of cores from these construction joints reveals that the tongue, or male portion of the joint, was seldom formed to the dimensions of the nice joint we had detailed. Generally, the top of the tongue was honeycombed. Therefore, we altered the detail to provide for a butt type construction joint. We still have the tie bar and have added a seal. We required that the joint be sawed and sealed to certain prescribed dimensions. As long as we have sufficient steel across the construction joint, this type will have equal or better load transfer characteristics than the tongue and groove.

The method for handling these tie bars during construction has been left to the contractor's ingenuity. He can drill holes in the forms to stick the tie bars through, as it is done in one district, or he may bend the tie bars at 90 degrees and wrap them with paper. After wrecking the forms, he can straighten the bars for placement of the next lane. A note printed on the plans states, "With the approval of the Engineer, multiple pieced tie bars, i.e., threaded couplings or other adequate devices, may be used to facilitate construction, provided the system develops a force equal to one and one-half times the minimum yield force of the tie bars shown."

There are numerous mechanical devices that meet the description. In a typical method now on the market, there are two reinforcing rods, each one half the length of the normal tie bar and threaded on each end. The other equipment is the threaded couple, into which the rods may be inserted. In a tensile test the reinforcing steel should break before the bar is pulled out of the threads or the couple fails. We have tested a device similar to this and found that it meets our requirements.

We hesitated to put a detail such

This paper was presented by Mr. McCullough at the 39th Annual Texas Highway Short Course held at Texas A&M University in December 1965.



Failure is impending on this section of I.H. 45 in Walker County. Exceptionally wide cracks are at a uniform two-foot spacing and spalling is severe. Inadequate vibration after the concrete was poured is the villain.

as this on the plans, because experience has shown that if a drawing like this is specified, it becomes the only acceptable solution. This is one possible solution. It does not necessarily represent the best or the only solution.

We have also prepared a design detail to take advantage of deformed wire, a recent product that has been commercially marketed by several steel companies. We designated the deformed wire to distinguish it from the smooth wire, which comes to mind when reference is made to cold drawn wire.

This material has several distinct advantages over plain wire and conventional reinforcing bars. First, it has extremely high strength properties with a yield of 70,000 psi, which is about a 17 per cent increase over high yield reinforcing bars. This allows us to reduce further the weight per square yard.

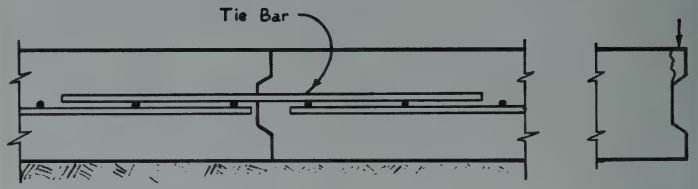
Second, the deformations give good bond properties to overcome the major objection to the old smooth cold drawn wire. The Research Section has performed bond tests on steel supplied by two major steel manufacturers and found the bond strength to be similar to that provided by conven-

tional reinforcing bars. A third advantage of the deformed wire is the low carbon content. By reducing the carbon content, the bar becomes malleable and less brittle, a real problem with the high-yield reinforcing bars. These bars can be bent at 90 degrees and straightened without breaking.

The low carbon content also permits the material to be welded. Therefore, there will probably be many instances in the future where we can weld the laps to replace the long laps and wire ties that we now have. This will give a greater flexibility if a suitable welding process is developed.

A fourth advantage over conventional bars is that any cross sectional area can be specified. In other words, if the design requires a wire with a cross sectional area of 0.185 square inch, we can call for the exact size. If we used reinforcing bars, we would have to use a one-half inch bar with a cross section of 0.20 square inch, which is a waste of steel.

We originally specified a 0.4 per cent longitudinal steel, but we revised the detail to 0.45 per cent after consulting with the Bureau of Public Roads.



Old Style Construction Joint

Mats should be five feet wide transversely and 33 feet, 4 inches long. The mat's effective coverage area after lapping is four feet transversely and 32 feet longitudinally. A 24-foot wide pavement requires six mats, so that the necessary lap stagger of 33 per cent is provided. The 33-foot length is an arbitrary figure selected on the basis of handling, weight, and shipping length. We prefer that these be as long as possible.

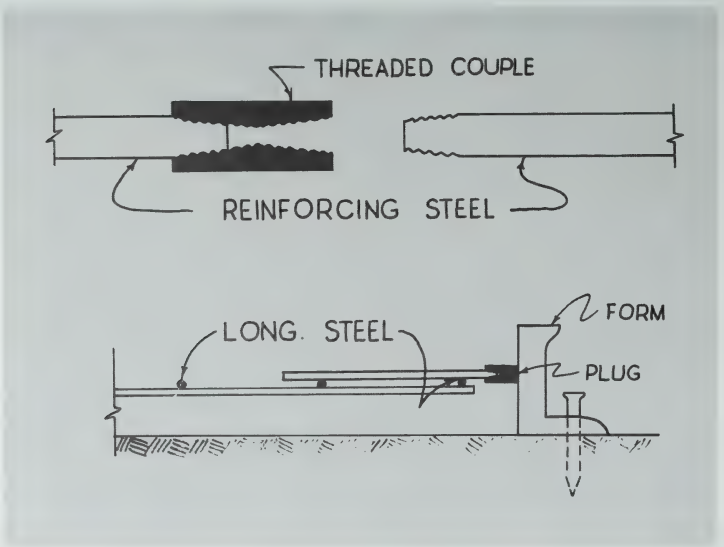
There has been only one project in the state where this design was used. The project was in Hill County in District 9, and was supervised by Claude Word of the Hillsboro residency. We had a number of problems initially, but most of them were overcome during the project. I believe experience indicated it is a feasible alternate to the conventional reinforcing bar design.

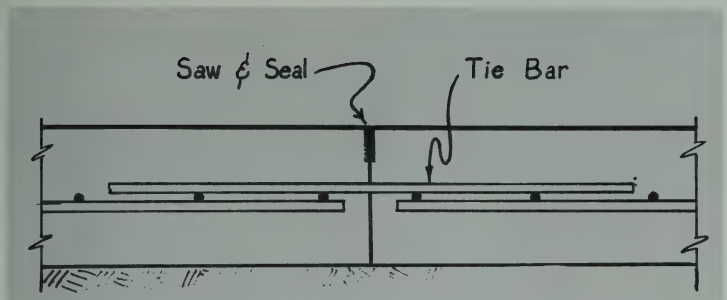
One of the problems was lapping the longitudinal bars. The detail showed a butt lap, but unfortunately it did not work out in the field as we had hoped. Therefore, we went to a shingle type lap. We simply placed one mat on the other as you would do shingles on a roof.

The first five mats went into the form easily, but the sixth mat was difficult to insert. Generally, it took more time to put in the sixth mat than the other five. We have overcome this problem on the latest detail by requiring a sixth mat to be fabricated without the transverse projections, so now it can be placed easily.

Both the contractor and Department personnel spoke highly of the material used on the Hill County project, not only in terms of construction cost but procedures as well. There were about 17 men on a steel crew as compared to a 28-man crew used on a conventional bar project by the same contractor in the next county.

We followed this job closely during and after construction. As mentioned earlier, the cross sectional area of steel on this project was 0.4 per cent. All measurements thus far in-





New Style Construction Joint

dicate that the stresses were considerably less than the yield point.

The crack spacing relationship of the Hill County project is almost identical with a Comal County project, which had 0.5 per cent longitudinal steel. But it is considerably larger than a Walker County project with 0.5 per cent longitudinal steel.

The Comal and Walker County projects had the same longitudinal steel percentage, but the Comal County job had ¾-inch bars at 11-inch centers. Walker County had #5 bars at 6½-inch centers. The Hill County project has about the same bond area as Comal County although the percentage is considerably smaller, but the relationship of the two is almost identical. This reaffirms the influence of the bond/area ratio.

As with any new product, there are always certain problems that develop, and continuous pavement is no exception. Although problems have developed, I want to state positively that the merits and performance we have obtained far outweigh any of the so-called demerits.

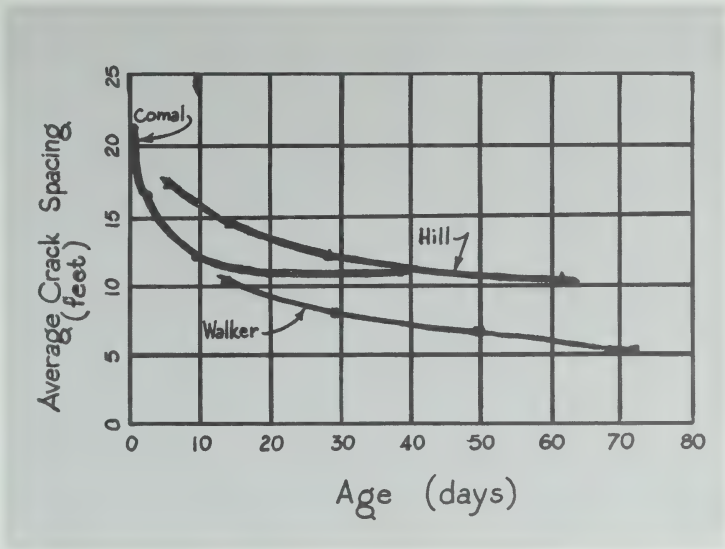
The largest single problem we face with this pavement type is inadequate vibration of the concrete. The importance of vibration cannot be overemphasized. Most of the failures from inadequate vibration have been at or near construction joints, but they have cropped up at all points in the slab.

Recently we discovered an area on I.H. 45 in Walker County where complete failure was impending. The cracks were at a uniform two-foot spacing, severely spalled and exceptionally wide. District 17 made a full-scale investigation which involved complete removal of the slab. Engineers found that the concrete above the steel was dense, but it was honeycombed below the steel. Subbase fines were also moving up into the slab. In essence, the slab was four inches of concrete over four inches of a spongy material. The steel was simply lying between these two layers and did not keep the cracks tightly closed.

Four inches of pavement are inadequate to carry the wheel loads on our highways.

Inadequate vibration coupled with warm weather compounds the problem. A number of these failures were observed on another project. Concrete vibration was not required on this particular project, but the data does illustrate the effect of temperature.

The project was continued over a six-month period, so we have placement days with maximum air temperatures ranging from 40 degrees to more than 100 degrees. We charted failures per placement day. Since placement days for a particular temperature range were not consistent, we divided the failures in a particular temperature range by the number of placement days. When the maximum air temperature on a placement day was between 40 and 90 degrees, we had less than 0.2 failures per day—there were an average of five days of placement before a failure occurred. Temperatures in the 90 to 100-degree range caused a tremendous increase in failures, and there was more than one failure for every day of placement. When a tempera-



When engineers removed the concrete slab from I.H. 45, they found dense concrete above the reinforcing steel while that below the steel was spongy and honeycombed. The steel was simply lying between the layers and did not keep the cracks closed tightly.

ture is in excess of 90 degrees, the concrete takes its initial set much more rapidly than at lower temperatures. Hence, if the vibration is not applied quickly enough, the concrete will take its initial set, and after that you can shake it until doomsday but you still have inadequate density.

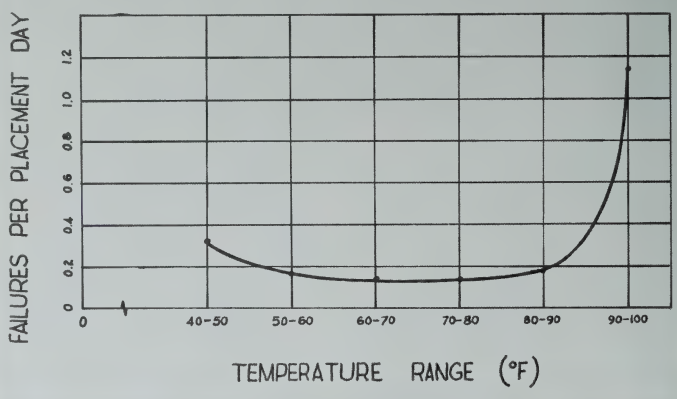
The trouble with these inadequate density problems is that they do not show up until after everyone has closed up shop and gone home. Then those five-axle trucks start using the roadway. When the wheel loads hit the pavement, it starts disintegrating within three to six months.

Since the Department has placed vibration requirements in the specifications, the inadequate density problem has been reduced. But my observations indicate that the problem is still with us to a certain degree. We talk about vibration, but actually we know very little about it. I hope in the future we may undertake a research project to give us more data on it.

Presently we specify certain frequency of vibration, no matter what the materials or temperature we use. My limited investigation into the literature available on this subject indicates that the proper vibration will vary with the aggregate shape, the water, and the air. Until we know more, I recommend that extreme caution be used on days when the temperature is above 90 degrees. Caution should be taken to use the vibrators as soon as possible after concrete placement.

Another problem is that of leave-outs. You may want to leave out a section of pavement temporarily for a haul road, an intersection, or some other reason, and then pick up at two to 100 feet away. The distances are for illustrative purposes only. In reality, the minimum distance would be anything larger than one-half inch and a maximum from 100 to 200 feet. Distances greater than 200 feet will present no problem if one follows the requirements of the normal transverse construction joint.

The problem develops where there are two free pavement ends that have started to fluctuate. After three days, the ends may be moving between 1/8 and 1/2-inch. Then when the fresh, green concrete is placed, it is like



Steel mats five feet wide and 33 feet long are used in building this section of I.H. 35 in Hill County, District 9. Six mats are used in the 24-foot wide pavement, providing the necessary lap stagger of 33 per cent.

tying two tigers together with wet macaroni. The old slab moves the steel in the fresh, green concrete before bond strength can develop, creating a wide crack at the construction joint. Unfortunately, no harmful effects can be seen until traffic hits the section. By then the crack is too wide and there is inadequate load transfer across the crack. The result is failure of the slab.

My first advice is to avoid any leave-outs. But if the construction sequence requires it, there are several ways in which the difficulties can be overcome.

The first suggestion is to place a leave-out during stable weather conditions, so that a minimum amount of end movement is present to be withstood by the fresh concrete. A second procedure is to stabilize the temperature of the free ends, again in an attempt to minimize fluctuation or movement of the old slabs.

A third precaution is to leave ample bar protrusion for lapping of the steel. The minimum requirement, of course, would be our normal construction joint requirements of a four-foot extension followed by a third of the laps every two feet.

Finally, my fourth suggestion is to place the leave-out first. Then there is only a short section pulling on the two green slabs at each end. This reduces the force by the smaller length of the slab, and increases the resistance area on each end. This is difficult to do because it is necessary to establish a grade line at the point of the point of the leave-out, but it will work. This has been done at intersections at several points in the state.

The Research Section of Highway Design Division has covered a wide range of factors in relation to continuous pavement. We have looked at it from the design standpoint, from the problems associated with it, and from our search for a design equation which we expect to have soon.

In order that we will be able to keep abreast of the problems and research in this field, we hope that everyone associated with construction, design and maintenance of this type pavement will contact us when problems arise. We may not be able to solve all problems as they occur, but as more and more cases are associated with it, we shall be able to take an over-all look and evaluate experience with this type pavement. In other words, continued cooperation is requested. ■

BRYAN'S MEDIAN-SIZED SOLUTION

Robert H. Schleider Jr., District Maintenance Engineer
Bryan, District 17

IN ORDER to improve traffic flow on State Highway 6 through Bryan and College Station, the cities' main artery which was operating above practical capacity most of the time, the Highway Department agreed to provide protected left turn lanes if the cities would eliminate parking on the route.

Available was a standard urban width of 64 feet back to back of curb, which had allowed two 8-foot parking lanes and four 12-foot running lanes separated by a standard double yellow barrier stripe.

One of the greatest objections to this facility was that at night the double yellow lines were barely visible and during a rainstorm they were completely covered. Road dust also easily covered this area.

With a continuous increase in traffic, accidents also increased. Between January 1, 1963, and November 1, 1964, there were 462 accidents, of which 51 per cent were rear end accidents; 21 per cent involved a vehicle turning left; 30 per cent involved a stopped vehicle; and 28 per cent were the result of right or left turns (21 per cent right and 7 per cent left). Eleven per cent were side-swiping type accidents, 10 per cent were head-on collisions. Of these accidents, 76 per cent occurred in the daytime and 26 per cent were at night; 66 per cent occurred on dry pavement and 34 per cent on wet pavement. Only 5 per cent of the 462 accidents involved an *intoxicated* driver.

The clear distance between the inside faces of the curbs was 63 feet. The storm sewer inlet design had to be taken into consideration in making allowance for the curb lane. Parking stripes had to be removed and the existing surface needed a seal.

The design agreed on was a 13.5-foot curb lane and a 12-foot median lane for both directions of travel. This left 12 feet for the median. A 10-foot left turn lane with a 2-foot divider was considered adequate.

It was decided to provide a median opening at every designated street intersection, whether it was a cross street or a T-intersection. The next decision was to place left turn lanes for both directions of travel at every median opening. This meant that at T-intersections one left turn lane might serve a private business or a vacant lot with no curb opening. However, we feel that this is justified since the left turn at a median opening was a legal maneuver and therefore could easily be protected since room was available. No additional openings are anticipated except where the cities designate new streets. So far we have had fine success with this policy.

A thorough study was made of the type median to use. And we thought each kind of median studied had at least one serious drawback. Since this area is highly developed commercially, a 6-inch barrier type curb would be hard to sell to the businessmen. On the other hand, a painted median would have the same objectionable qualities as previously stated concerning the double yellow barrier lines. The lines could not be seen at night or during inclement weather.

We decided to provide a raised stripe about 1½ inches high and 12 inches wide. This would be a great improvement over what we had and yet little argument could be offered that it was a physical barrier.

Since we needed to obliterate the existing traffic stripes and also provide a seal for the old hot mix surface, a slurry seal was selected to do the job. Putting all these recommendations into a proposed project, we requested Austin office approval for a 6-mile job on S.H. 6, from S.H. 21 in the Bryan to Jersey Street in College Station, to place a slurry seal and provide a raised stripe median with left turn lanes.

Grading requirements for the slurry seal material ranged from 100 per cent passing the quarter inch screen, to 5 per cent to 15 per cent passing the No. 200

This paper was presented by Mr. Schleider at the 39th Annual Texas Highway Short Course held at Texas A&M University in December 1965.

State Highway 6 through Bryan was operating above practical capacity when, to alleviate traffic conditions, the Highway Department eliminated on-street parking and added left turn lanes (right).

sieve. SSI-H Asphalt Emulsion was specified and the residual asphalt content was to be from 9 to 15 per cent.

The slurry seal machine was leased by the day rather than by the square yard—an arrangement we believed best for all parties because of the time of year and the heavy volume of traffic. Traffic was handled by using cones.

The slurry seal was placed in five passes—12½-foot widths with a 3-inch overlap. The first two passes were made on Sunday and covered the curb lanes. The next two were made adjacent to these, and the last covered the remaining width down the center. Cross streets were closed until the slurry broke, which generally required one and a half to three hours, depending on the time of placing.

Approximately 8 to 10 pounds per square yard were placed. The charged hopper contained approximately 2½ tons emulsion, 2½ tons water and 5 tons of slurry fines. The ten tons covered approximately 2,000 feet, 12.5 feet wide. The slurry seal was placed over this distance of 2,000 feet in 25 minutes. Two trucks were used to maintain a continual placing operation. It appears that the surface texture improves under traffic. Because of the tenderness of the slurry seal, we found that it was better to wait two days before placing the raised stripe.

L. D. Hancock, engineering assistant II in the Bryan residency, was in charge of the geometric design. The geometric design of the medians was different for almost every intersection due to a wide variation in block lengths. The median openings at street intersections were set at 80 feet—40 feet on either side of the centerline of the city street, and large enough to accommodate all types of vehicles without encroachment of the curb lane.

The reverse curves used were generally 77 feet and 109 feet in length. In several instances a 44-foot reverse curve was used where city streets were extremely close to each other. This is not desirable, but so far the results have been excellent.

The length of left turn lanes was based on the number of turning movements observed, but in most cases the length of the left turn lanes was set by the block length. Some are already operating at capacity.

The men in our maintenance sections are capable of performing almost every task required, regardless of

Asphalt striping machine, designed by Delmar Crenshaw of the Bryan Maintenance Section, in action on S.H. 6.

Luke Marino guides the wagon developed by District 17 maintenance men for placing rock asphalt mix.

how difficult it might be, and this was certainly true in constructing the medians.

We told our men that we wanted a 12-inch wide raised stripe about 1½ inches in height. Hot mix was tried at first, but it remained too tender and traffic tended to shove and rut it before it could be painted. Concrete was considered but we believed something more economical could be used. Rock asphalt was found to be the material that met our requirements.

After the line had been staked, a string line was placed to guide the tacking operation. Delmar Crenshaw of the Brazos County Maintenance Section took an old pilot line machine and adapted it for placing the tack coat. A gravity spray bar was installed and a felt roller was added to spread the asphalt. RC-2 asphalt, cut back additionally with gasoline, was applied at the rate of .1 gallon per square yard. This could be placed accurately as to line and was used to guide the placing of the rock asphalt.

Three of our District 17 maintenance men developed a wagon that would place the mix to the desired height and width. James (Bud) Sloan, maintenance construction supervisor; Arlen (Doc) Evans, maintenance construction foreman III; and Russell L. Jones, shop foreman IV, combined their talents in building the wagon. Each wheel could be adjusted vertically and each wheel could be turned to change direction horizontally. Fresh type CC Rock Asphalt worked very well—placed at 2¾ inches in height with the rolling operation compacting it to the desired 1½ inches high.

Two wagons were used—one 12 inches wide and the other 24 inches wide. The divider adjacent to the left turn lanes was constructed with the 24-inch wagon, and the median strips were constructed with the 12-inch wagon.

The wagon was charged by shoveling the material from a truck, keeping the wagon about three-fourths full. The men preferred this method to using a chute. With the tailgate of the truck down, the truck provided the power and Luke Marino was in control of the guidance system.

The front wheels of the self-propelled pneumatic roller rolled the edges of the rock asphalt strip, and the back wheels covered the remaining portion. Three passes compacted the mix and two more gave it a uniform appearance. A stinger on the roller enabled the operator to place the roller wheels in the exact position. Grooves were later cut in the strip to allow for drainage. We found we could place 100 feet of raised stripe in seven minutes. This represents approximately eight average city blocks per day.

The striping operation was done primarily with the hand striping machine. One four-inch stripe was placed on each side of the finger as well as the wider parts of the median. We later painted the inside edges of the wide medians. This provides the double yellow barrier line appearance.

Bill Bockmon, traffic engineer for District 17 who was in charge of this project, reported that the unit costs involved in this operation included 9 cents per square yard for the slurry seal and 20 cents per linear foot for the raised stripe.

We are pleased with this arrangement, and from the number of compliments we have received it seems that the townspeople are also satisfied. According to the police departments, the accident rate, compared to a like period a year ago, has been drastically reduced on this section of highway.

There are some violations, such as crossing the median, making U-turns, and using the left turn lanes in reverse of what was intended. These violations will take time to eliminate, but we believe our law enforcement officers will take care of this. ■

What Is a Median?

WEBSTER DEFINES the term as "being in the middle." It took a joint committee of the Highway Department and the Texas League of Municipalities a few more words: in a 1960 report entitled "Why a Median?" the committee defined a median as any traffic separator on a four or more lane road which is more positive than the standard double stripe at standard spacing.

The committee also recognized three types of median:

- A traversable median—one that consists of paint stripes, buttons, an area of pavement with contrasting color or texture, or a combination of any of these. Its purpose is obvious but it should not present a physical barrier to traffic.
- A deterring median, one that may incorporate any of the features of a traversable median plus a minor physical barrier such as a rolled asphalt curb, bars, corrugations, or mountable curb.
- A barrier median, one that traffic will not cross intentionally —a barrier curb, guard rail, or some type of wall.

Generally, medians should be provided when traffic volumes are such that a four-lane facility is needed to move traffic, or if the speed of traffic on a four-lane section is 35 mph during off-peak periods.

In recent years considerable attention has been given to the various types of traversable and deterring medians. A study of several California highways made to compare curbed medians and painted medians indicated that curbed medians are no safer than painted ones.

Other conclusions:

- A curb will not prevent inadvertent median crossings. If the front wheel of a vehicle hits the curb, the car is apt to cross the median and go out of control.
- Median openings should be placed at each public street intersection.
- Curbed medians should be provided where median signals are installed.
- A minimum 400-foot spacing between openings is desirable.
- U-turns are worse than left turns, and therefore openings should be provided wherever traffic requirements call for them.
- Intermediate openings should not be provided where they will conflict with channelization at intersections.
- Provision for left turn lanes greatly increases the capacity of the facility.

Perhaps the most revolutionary median design is the one that has been used on the West Coast, particularly in Washington and California. They have given it the long name, "Two-Way-Median-Left-Turn Lane," or 2WLTL. A 2WLTL consists of a median area delineated only by paint lines that can be used by traffic in either direction for making left turns. Left turns may be made from any point along the 2WLTL. Its major functions:

- Provides deceleration and storage lane for left turns, both to streets and to abutting properties.
- Separates opposing traffic flow.
- Provides an acceleration lane for vehicles turning left onto the arterial street from a minor street and abutting properties.
- Provides a pedestrian refuge.
- Provides an emergency lane for breakdowns or for use by emergency vehicles.

One difficulty with the 2WLTL is marking and signing, because there are no standards to follow. Highway engineers do not want to discourage drivers from using the 2WLTL, but some way has to be found to keep them from using it as a running lane. Pavement markings reading "Left Turn Lane" in both directions of travel are used with overhead signing.

The "Audible" or "Singing" median has also been discussed by highwaymen for several years. The object of this type is to provide a divider that will be more effective than a white line but not as expensive as a structural barrier. The singing median is made of a corrugated concrete surface about four feet wide, with 4½-inch spacings of corrugations one-half inch deep. Shallower grooves become filled with sand and dirt, and a wider pitch produces only a dull, buzzing sound. The 4½-inch pitch produces a resonant hum. The tone rises with the speed of the vehicle—a fast car produces a high whine and a slow car causes a bass grumble.

A continuous strip did not register with the motorist who evidently thought he was just riding over a changed or rougher stretch of pavement. The solution for this was to alternate bands of six-foot smooth surfaces and four-foot rippled surfaces. Although the ripples fill up with sand, this does not seem to affect performance to any extent. ■

A BRIGHTER DAY

Pasadena Star News Citizen, speaking editorially—"We have one of the fastest growing areas of the state and the nation—served by some of the worst roads and highways in the nation.

"But we have learned some of the ways to get help in solving some of our highway building problems.

"This is what our new chamber of commerce president, Dr. Tom Spencer, said Thursday when chamber leaders met to thank and to honor Jack Kultgen, a member of the Texas Highway Commission, for state help which has recently come our way.

"As Dr. Spencer pointed out, we have learned locally that when we want something and are willing to do our part, the state agency is more than fair and helpful. . . .

" 'The main reason you have lousy roads is that you came from nowhere so quickly,' " Kultgen explained. . . .

"We can't worry about the roads we didn't have or couldn't get. We need to worry about the roads we need."

A THINKING MAN'S BULLDOZER

Victoria Daily Advocate states—"The Texas Highway Commission has authorized the construction of a roadside park on U. S. Highway 67 in Pecos County where dinosaur tracks have been discovered.

"In South Dakota, maintenance crews mowing the highway right of way in the spring leave wide strips of grass along the fence line because it is a favorite nesting area for hen pheasants.

"A recent directive by the Bureau of Public Roads is intended to eliminate the bulldozing condemnation practices of some states. It requires that to qualify for federal aid, a state must undertake right of way negotiations with a property owner on the basis of a firm offer in writing of the state's full appraisal of fair market value before the start of condemnation proceedings.

"This thing we call progress can be an inexorable bulldozer, indeed. It is reassuring to know that there is concern in high places that the massive roadbuilding program the nation is presently engaged in does not needlessly overrun or bypass other things we call human values."

THREE CHEERS FOR McNAMARA

Orange Leader, saluting—"A local group which seldom receives any recognition but is due a lot is the Texas Highway Department's resident engineer, Tommy McNamara, and his staff.

"Although handicapped by a chronic insufficiency of money, equipment and personnel, these people do a tremendous job of building, improving, maintaining and keeping clean the portion of the state's highway system for which they are responsible. . . .

"Economic development in that segment of the Sabine River Watershed, already under way, will generate new demands for state highway construction, improvement and maintenance which will be difficult to meet quickly enough to avoid serious traffic problems.

"McNamara has seen this development coming for the past several years and to the limit of his resources has made an effort to get a jump on the problem.

"And the portion of the job that still lies ahead is one that the resident engineer and his staff cannot perform to the limit of their ability without the cooperation of taxpayers and their county governments in this territory."

NEW APPROACH NEEDED

Galveston News reveals—"Texas Highway Commissioner Jack Kultgen of Waco, here Wednesday for an address to the Rotary Club confided to some friends that traffic volume is growing so rapidly that already some of the federal Interstate highways are obsolescent. This is no surprise to many motorists.

"Even the Gulf Freeway, Interstate 45, is so overloaded with vehicles at times during the day that it poses serious control problems. And it seems only yesterday that these magnificent ribbons of concrete were being viewed as the solution to traffic congestion for many years to come."

AWARDS

(Effective March 31, 1966)

40 Years

District 21
Manuel J. Gonzalez, Skilled Laborer

District 23
Larkin C. Cleveland, Maintenance Construction Foreman III

35 Years

District 14
Max Barth, Semi-Skilled Laborer

District 17
Albert W. Massey, Skilled Laborer

30 Years

Equipment and Procurement Division
George Coleman, Clerk II

District 5
Eugene Munselle, Maintenance Construction Foreman III

District 8
James H. Bush, Shop Foreman II

District 10
Dennis D. Rousseau, Maintenance Construction Foreman III

District 11
Robert A. Cox, Engineering Aide IV
Luther Long, Skilled Laborer
A. J. Pringle, Maintenance Construction Foreman III
Thomas F. Rector, Maintenance Construction Foreman III

District 12
Angus M. Ryan, Master & Pilot

District 13
Aster D. Anderson, Skilled Laborer

District 15
Benno Froboese, Skilled Laborer

District 18
Bannister L. DeBerry, District Engineer

District 19
Richard C. Porter, Skilled Laborer

District 25
* Robert L. Nabers, Assistant District Engineer

25 Years

Planning Survey Division
Gus Willeford, Machine Accounting Supervisor I

Motor Vehicle Division
Maurice E. Burkhart, Accountant III

District 2
Earnest C. Clay, Maintenance Construction Foreman III
Fred N. Geye, Maintenance Construction Foreman III

District 6
Henry M. Tipton, Skilled Laborer

District 9
Wilson G. Kaiser, Inspector III

District 10
Donald V. Frazer, Engineering Aide IV

District 12
James W. Hail, Engineering Aide IV
Edward L. Traylor, Engineering Aide IV

District 14
Joseph O. Schott, Engineering Aide IV
Arville A. Young, Maintenance Construction Foreman III

District 15
Bennie L. Roberts, Draftsman III
Clifton G. Sims, Skilled Laborer

District 16
Karl R. Kutzer, Maintenance Construction Foreman III

District 20
John G. Keller, District Engineer
Clobus Romero, Skilled Laborer

District 21
Reinaldo S. Garcia, Semi-Skilled Laborer
Alfonso C. Munoz, Semi-Skilled Laborer

* Retired

RETIREMENTS

Planning Survey Division
Peter T. Smith, Accountant III
Ella M. Sturdivant, File Clerk IV

District 2
Daniel Tomerlin, Semi-Skilled Laborer

District 3
Robert R. Schultz, Engineering Aide IV
Floyd M. Whetsell, Skilled Laborer

District 6
Eddie J. Young, Skilled Laborer

District 7
Milburn Hunsucker, Skilled Laborer

District 9
Thomas W. Porter, Maintenance Construction Supervisor I

District 10
Richard L. Harris, Engineering Aide IV

District 19
Thurman Glover, Semi-Skilled Laborer

District 20
Archie Kelley, Skilled Laborer

District 21
Edward L. Wilde, Materials Analyst II

District 23
Farris K. Jones, Skilled Laborer

District 25
Joseph R. Long, Maintenance Construction Superintendent

To and From Our Readers

Freeway Education

The Dallas Morning News ran a story by Gene Ormsby in early February about an unusual plan for I.H. 20 (Thornton Freeway) in downtown Dallas:

A unique educational campaign is being planned to assist Dallasites in the best and safest use of the intricate $27,000,000 Thornton Expressway extension which will be opened soon, State Highway Commissioner J. H. Kultgen revealed here Wednesday.

Kultgen met in the Sheraton-Dallas Hotel with about 35 officials to discuss the campaign for opening what Dallas leaders consider the most modern highway link in Texas. . . .

Earl Hayes, chairman of the chamber's central highway committee, said the meeting was held at the suggestion of Dewitt C. Greer, state highway engineer in Austin, and the Texas Highway Commission. . . .

Hayes called this a new concept in opening a freeway. "Most of the time," he said, "a freeway is opened by a ribbon cutting, and people don't know how to get on or off it or anything else."

Hayes said he expects there will be public demonstrations on the freeway about a week prior to the opening.

"It will be like a football coach walking his men through the plays," Hayes said after the meeting. "I'd like to get about a half dozen busloads of people and some cars and walk them through, and have parades and things of that nature." . . .

Hayes said police would be stationed along the extension to assist drivers.

Here's a Helpful Hint

Experiments at India's Central Road Research Institute in New Delhi have shown that bamboo added to a mixture of nine parts soil and one part cement makes a road surface two or three times more durable than the commonly used "cement soil" by itself.

A First for District Five

Joel Willson, maintenance construction superintendent, had an unusual "first" to report from District 5.

"We guess just about everybody will jump and cringe at the mere mention of the word 'petition,'" Joel wrote. "We have received many petitions through the years asking for this, that, or the other, or complaining about drainage, poor maintenance, poor construction, poor everything. A person might even reach the point where he hates to hear the word 'petition' used.

"So, it was really refreshing recently when District Engineer Oscar Crain at Lubbock received a petition signed by all adjacent property owners along both sides of newly completed Farm Road 2378 in Lubbock County. This petition commended and thanked Mr. Crain for building the new road and said the road would certainly be helpful in transporting their farm products.

"We do not know if this is the first one of its kind in the state, but it certainly is the first in District 5."

"FEZBY HAD TROUBLE ADJUSTING TO RETIREMENT AT FIRST . . . . HE ALWAYS SLEPT BETTER IN A CHAIR, YOU KNOW."

TEXAS HIGHWAY COMMISSION

HERBERT C. PETRY JR.	Chairman
HAL WOODWARD	Member
J. H. KULTGEN	Member
D. C. GREER	State Highway Engineer

TEXAS HIGHWAYS, official journal of the Texas Highway Department, is published in the interest of highway development in Texas and for departmental education in construction, maintenance, and operation.

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District Engineer C. B. Thames, assisted by two lovelies, Diane Thurmond (left) and Lynn Wells, cuts the ribbon formally dedicating a 14-mile section of I.H. 45 in Madison and Walker counties. The dedication took place October 28, opening for motorists a superhighway between Houston and Madisonville, a distance of about 100 miles. Total cost of the project was approximately $4.36 million.

Passing the Buck

Not too many years ago, President Harry Truman had a sign on his desk reading, "The buck stops here."

Everyone knows what it means. "Buck passer" is a dictionary word. But what's the buck that gets passed?

Maine Highway News reports that one theory is that it was originally a buckhorn knife.

Why was it passed? Because it marked the next dealer or banker in a card game.

In other words, it fixed responsibility to shuffle, to deal, to announce the fall of the cards, to watch the bets, call the turn, judge disputes, to preserve order and decorum.

Letter Exchange

TEXAS HIGHWAYS received the following letter in January, and we pass it along for possible pen pals for the Britisher:

With reference to your travel brochures on Texas, the copies of which I obtained in London. I noticed that the word 'Information' is mentioned. For some time I have been trying to obtain a pen-friend in the Republic of Texas without success. We don't get Texas newspapers in London like the New York papers, and the American Embassy in Grosvenor Square wasn't able to help regarding these articles. Therefore I should be glad if you could please give me the address of a pen-friend organization in Texas which I could contact.

Michael Boydell
20 Cecil Park, Pinner
Middlesex, England

Texas Facts

The Texas Highway Commission has directed that informational markers bearing facts about Texas be erected at each of the Department's tourist information bureaus, located at Anthony, Orange, Waskom, Texarkana, Denison, Gainesville, and Wichita Falls. Another bureau is being built in Amarillo. The Department also operates an information center in the rotunda of the Capitol in Austin.

The markers will include data dealing with the historical, geological, cultural, and scenic resources of the state.

Mr. South Texas

Herbert C. Petry Jr., chairman of the Texas Highway Commission, was named "Mr. South Texas" for 1966 by the George Washington's Birthday Celebration Association. A frequent visitor to Laredo, Petry was honor guest for the Fiesta held February 17-20. Jim Slaughter was president of the 69th Annual Celebration.

Petry is the fifteenth individual to be named "Mr. South Texas." Previous recipients of the honor include Laredo Mayor J. C. Martin Jr., Governor John B. Connally, and Federal Judge Reynaldo G. Garza.

Newsletters, Anyone?

Pat Brown, secretary-receptionist in District 22, made a request this month to TEXAS HIGHWAYS that we would like to pass along to other districts.

"Would you by any chance," Pat writes, "have a list of the other districts that put out a monthly newspaper? If you do, I sure would appreciate your sending me a copy of the list. I would like to be put on their mailing list."

We don't have a list, but Pat has a good idea. TEXAS HIGHWAYS would like to receive copies of district news letters, too. The only other district that sends us one is District 11.

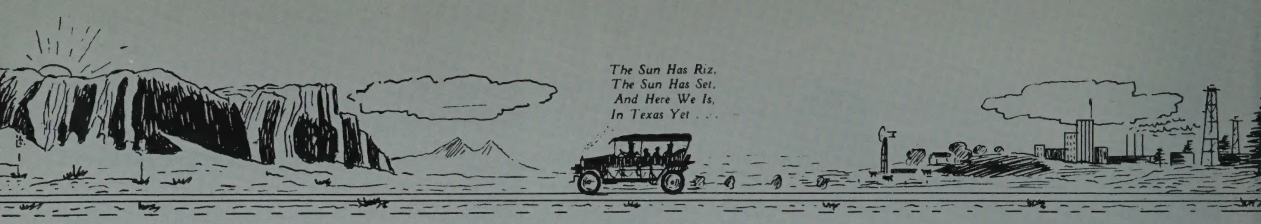
How about it?

Hook 'em Highways!

Jack R. Maguire, executive director of the Ex-Students' Association of The University of Texas, sent this letter recently to Herbert C. Petry Jr., chairman of the Texas Highway Commission:

"I have just had an opportunity to read your excellent report titled '1965—A Year of Progress in Highways for South Texas' in the December issue of the *South Texan.*

"This is a marvelous report which certainly should indicate to us taxpayers a fact that most of us have known for a long time: We have the finest Highway Commission and finest staff of highway engineers in the country. Congratulations to you for the wonderful job you're doing."



OVER THE HIGHWAYS

Comments . . . from the Traveling Public

• I have just returned from a 1,400-mile tour of areas of Texas that I had not visited before. My guide map was the official map of the Texas Highway Department for last year.

The unmarked roads on the map caused me to miss dozens of short cuts and interesting side trips, and sent me into glutted city traffic when it could have been avoided. Because many of the paved roads are not on the map, I consider it a flop and more of a handicap to the traveler than a help.

Glen Amonett
Petersburg

Editor's note: The 1965 Official State Highway Map shows all connecting routes of the state highway system maintained by the Texas Highway Department. Some farm to market roads serving local traffic only are not shown on the map, nor are paved county roads not maintained by the Texas Highway Department.

• The most confusing and dangerous commercial sign on the highway from San Antonio to Austin at about New Braunfels appears as a moving danger sign. It is on north side of highway, visible from the south and looks like a highway sign—four large red moving balls or circles.

Try to eliminate this at once; it is a real hazard.

I'd hate to have to notify Lady Bird.

Please let me know what and when you do something about this.

Mrs. Robert Duncan
San Antonio

• Will you please send me your latest official highway travel map. Mine is out of date and worn out as I got it from you in 1951.

Thanks.

Mrs. W. E. Vaughn
Denton

• For the past 10 days we have had below-zero weather, down to 30 degrees below zero, winds up to 80 miles an hour, and drifts of snow to be shoveled off the walk every morning.

So I would like two copies of information for my friend and me about your state, its holiday attractions, its industries, and climate. Please send me the literature that you have for distribution.

Norman White
Regina, Saskatchewan, Canada

• This is Janie Hanks again. I hope you remember me? Do you? Please send me a folder with 50 pictures in it. Please send me 50 pictures on the beach, pretty waters and the most prettiest things on Texas. I am still making the scrapbook. And the teacher said to have a hundred or more so please send me 50 pictures or more. Just me and Beverly Culpepper and Pam Allen are the only ones that do not have more than 50. I have 50 now but if you will send me 50 more pictures I will have 100, so please send me 50 pictures.

Janie Hanks
Jackson, Mississippi

P.S. Please send me 50 pictures. Please

Editor's Note: The following letter was received by James Weldon Moody, semi-skilled laborer at the Bovina maintenance section, District 5. He and Bobbie E. Bradshaw were working along U.S. 60 in Parmer County when they found a train in trouble. It had become uncoupled, or "unknuckled," and the two separated portions of the train were about one-half mile apart. Moody and Bradshaw handled the knuckle for the crew and assisted them in making repairs.

• Conductor Day, Train 1379 East on January 28, reports that they broke a knuckle and it was necessary to haul knuckle to replace the broken one. He informed me that you stopped and hauled this knuckle for them which saved considerable delay to this train.

I would like to take this means to personally express my appreciation for the services you rendered. It is nice to know that we have friends along the railroad that will take the time to assist us in time of trouble.

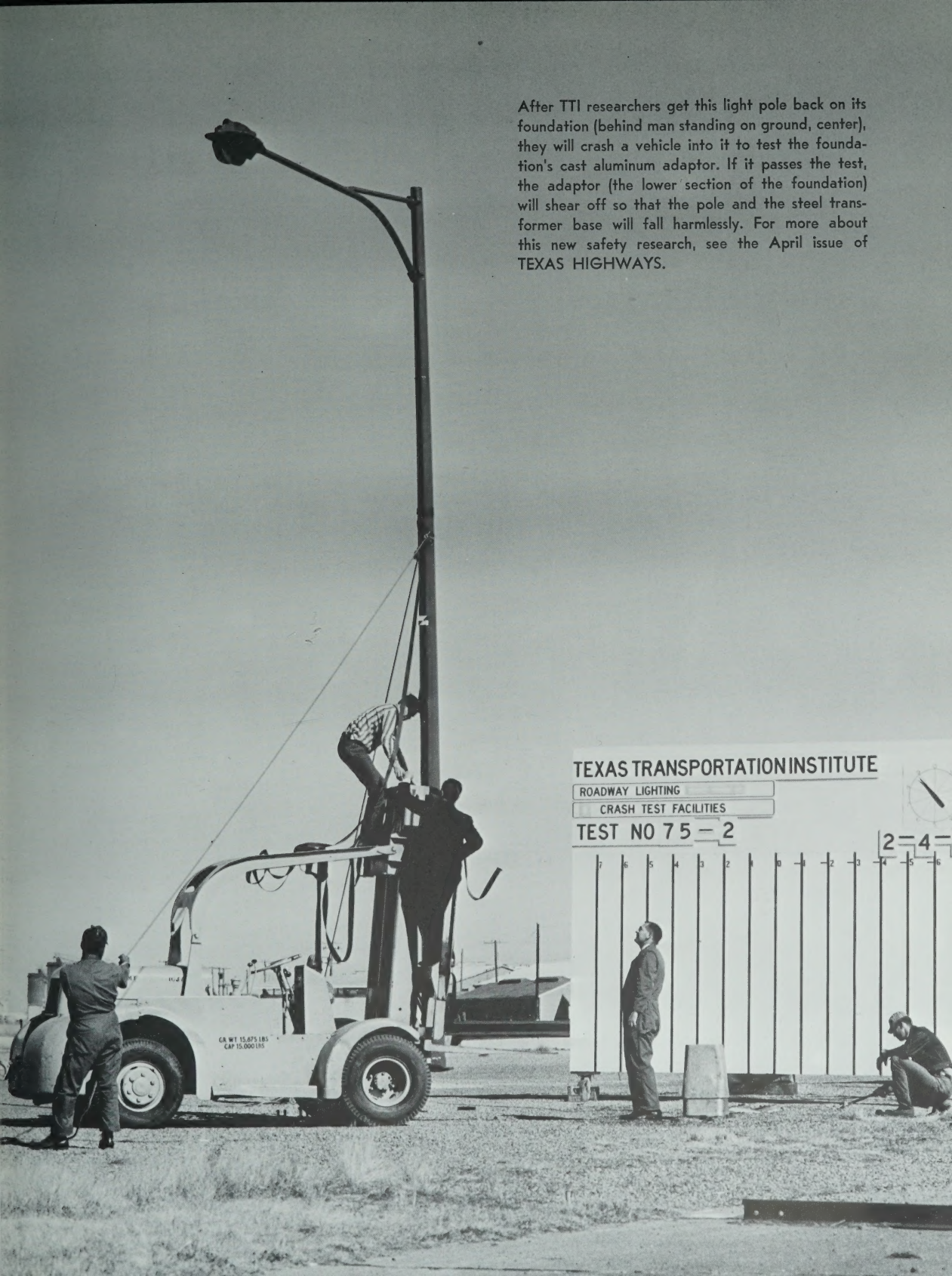
K. C. May
Superintendent, Plains Division
The Atchison, Topeka and Santa Fe Railway Company

• Recommendation:

Trying to reach Interstate 10 from El Paso at Ysleta we found no signs to assist us from Alameda Avenue.

There should be clear directions for your tourists.

Anna Lavarmi
San Anselmo, California



After TTI researchers get this light pole back on its foundation (behind man standing on ground, center), they will crash a vehicle into it to test the foundation's cast aluminum adaptor. If it passes the test, the adaptor (the lower section of the foundation) will shear off so that the pole and the steel transformer base will fall harmlessly. For more about this new safety research, see the April issue of TEXAS HIGHWAYS.